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Organizational Behavior and Human Decision Processes 96 (2005) 89–103
ORGANIZATIONAL BEHAVIOR AND HUMAN DECISION PROCESSES
www.elsevier.com/locate/obhdp

Towards a competitive arousal model of decision-making: A study of auction fever in live and Internet auctions☆

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Received 28 July 2003
Available online 13 December 2004

Abstract

In 1999, Chicago sponsored a public art exhibit of over 300 life-sized fiberglass cows that culminated in 140 Internet and live, in-person auctions. Collectively, the cows sold for almost seven times their initial estimates. These unexpectedly high final prices provided the impetus for a model of decision-making, "competitive arousal," which focuses on how diverse factors such as rivalry, social facilitation, time pressure, and/or the uniqueness of being first can fuel arousal, which then impairs decision-making. In Study 1, live and Internet bidding and survey data from 21 auctions throughout North America tested the model's predictions, as well as hypotheses derived from rational choice and escalation of commitment models. Analyses provided considerable support for the competitive arousal and escalation models, and no support for rational choice predictions. Study 2 was a laboratory experiment that investigated the similarities and differences between escalation and competitive arousal, finding again that both can result in overbidding. The discussion focuses on the implications of these findings and on the broader issue of competitive arousal and escalation and their impact on decision-making.

Keywords: Decision-making; Rivalry; Social facilitation; Time pressure; Escalation of commitment; Auctions; Competition; Arousal

In the summer of 1999, Chicago was inundated with cows. Lots and lots of cows. A public art exhibit, "Cows on Parade," displayed over 300 life-sized fiberglass cows decorated by hundreds of local artists. In early November, 140 of the cows were put up for auction, with the proceeds donated to charities. Seventy-five cows were sold on the Internet with auctions beginning on November 1, 1999 and ending 9 days later. That evening, Sotheby's conducted a live auction for 65 more cows. Sotheby's also provided price estimates for all of the cows prior to the auctions. However, since painted, decorated, and creatively altered fiberglass cows had never been sold before, sharp estimates were difficult. Instead, costs (around $3000) were a critical anchor for the price estimates, and most price estimates were expressed as a range from $2000 to $4000. As it turns out, the cows sold for considerably more than anticipated. In total, they generated $3,477,252, almost seven times initial estimates. Although the auctioneers claim that they did not

☆ This project benefited from the assistance and support of several organizations and many people. First, we gratefully acknowledge the financial assistance of the Dispute Resolution Research Center at the Kellogg School of Management at Northwestern University. We also thank auction organizers from all over North America who provided us access and insights to their auctions. Michael Jensen, Chen-Bo Zhong, and Adam Galinsky provided both comments and help with the data analysis. Finally, we thank Don Moore, Madan Pillutla, and Alvin Roth for their constructive comments on earlier versions of this manuscript.

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0749-5978/$ - see front matter © 2004 Elsevier Inc. All rights reserved.
doi:10.1016/j.obhdp.2004.10.001

set the estimates low to lure more bidders (Ku, Galinsky, & Murnighan, 2004; Rozhon, 2000; Sotheby's, 2000) and evidence suggests that auction houses make fairly accurate predictions (see McMillan, 1992), the sale prices for the Internet and live Chicago cow auctions were 575 and 788% of the estimated prices, respectively.

The success of the Chicago auctions led to many followers, with cities around North America featuring fiberglass cows, pigs, moose, fish, and other animals and objects, all to be auctioned after a few months of public display. Although some of these auctions were outright failures, others raised much more money than anyone had anticipated. In Chicago and in the other cities, both bid data and survey responses suggest that many bidders exceeded their pre-set limits. When asked to explain their overbidding, bidders' statements centered around high levels of arousal and auction fever. For instance, a Cincinnati pig winner noted that she "REALLY wanted the pig, and probably also got caught up in the competitive nature of the auction." Another simply said, "Auction fever took over."

Auctions have a rich and varied folklore in which auction fever—the emotionally charged and frantic behavior of auction participants that can result in overbidding—is an important element, even in Internet auctions. For instance, consider Prince's (1999) description of Internet bidding: "When the competition swings into high gear, e-motion really comes into play, big time… In the beginning, you might feel it as an affront, almost offensive, when someone else bids on something you want… But you decide you won't back down. Come Hell or high water, you're going to stand triumphant" (pp. 171–172). Although anecdotal evidence suggests that auction fever is common, to our knowledge there have been no attempts to develop a systematic conceptualization or rigorous empirical analysis of this phenomenon. Thus, we report two studies that examine the causes of auction fever.

Theoretically, we suggest that auction fever is an irrational, multiply determined process. For instance, bidders who have invested time, bids, and energy in an auction may feel a need to justify their actions and escalate their commitments, leading them to bid past their limits. Although escalation of commitment is consistent with the behavioral outcomes of auction fever, it does not consider the role of emotions and the intense arousal that is inherent in auction fever (and its folklore). Thus, we propose a new competitive arousal model of decision-making, which suggests that factors that induce arousal will result in impaired decision-making processes and outcomes.

Models of escalation and competitive arousal are complementary rather than mutually exclusive. In addition, both models stand in stark contrast to a rational choice model of bidding. Thus, either or both may provide a clear conceptualization of auction fever. The empirical research that we present here uses bid and survey data from a field study of 21 live and Internet auctions plus a laboratory experiment to test hypotheses from all three models.

Although the dynamics of public auctions are the immediate context of this research, we interpret individuals' bids as examples of important individual and/or organizational decisions. For instance, many organizations participate regularly in auctions as they bid for projects, contracts, or purchase orders, and executives and top-management teams often find themselves caught in a bidding war to acquire companies or to hire important new employees. These examples suggest that the study of auctions may be particularly relevant for understanding a variety of decision-making processes.

Auctions and rational choice

Economic approaches to auctions encompass a large theoretical and experimental literature that focuses primarily on how different kinds of items (e.g., independent private value vs. common value) and mechanisms (e.g., English, Dutch, first-price, and second-price sealed-bid auctions) generate revenue (see Kagel, 1995; McAfee & McMillan, 1987; Vickrey, 1961 for reviews). Issues such as risk aversion, uncertainty, collusion, learning, and the number of bidders have played large roles in this research.

With few exceptions, research in economics has presumed bidder rationality and has focused its empirical analysis on market level measures and outcomes (e.g., efficiency, revenue generated, etc.). Systematic empirical research on individual bidder behavior has essentially been limited to the winner's curse (e.g., Thaler, 1992), which involves a winning bidder paying more than an auction item is worth. This outcome results when an item's value is initially uncertain and each bidder has an estimate (i.e., a "noisy signal") of the true value of the item. Since the average of the bidders' estimates is likely to be close to the true value, the winning bid is often based on an overestimation of the item's true value, suggesting that a winner will often overpay and feel regret.

Research has shown that the winner's curse is quite robust, occurring even with experienced bidders, and particularly as the number of bidders increases (Foreman & Murnighan, 1996; Kagel, 1995). Although the winner's curse and auction fever both result in overpaying, the winner's curse primarily results from uncertainty about an object's value (Kagel, 1995). In contrast, auction fever is primarily emotional. Thus, bidders can be calm and economically rational and still suffer the winner's curse if their information is poor. There seems to be little that is rational, however, about auction fever: even when bidders have perfect information, they may still overbid when they are influenced by intense emotions and arousal.

The recent explosion of on-line auctions has provided new arenas for auction research. Lucking-Reiley and his colleagues, for instance, have tested economists' predictions regarding the impact of varying auction formats (Lucking-Reiley, 1999b) and for instituting public vs. secret reserve prices (Katkar & Lucking-Reiley, 2000; Lucking-Reiley, 1999a). Their results challenge some of the claims of extant theory. Economic models, for example, distinguish among English ascending auctions (the winner is the last remaining bidder), Dutch descending auctions (the winner makes the first and only bid), first-price sealed bid auctions (the highest bidder wins for the price bid), and second-price sealed bid auctions (the highest bidder wins but only pays the second highest bid), and argues that, with certain assumptions, revenues from first-price sealed-bid and Dutch auctions should be equivalent and revenues from second-price sealed bid and English auctions should be equivalent. Instead, Lucking-Reiley (1999b) found that Dutch auctions generated 30% higher revenues than first-price auctions. In contrast, other empirical research supports economic predictions and finds that bidders often behave quite rationally: they are sensitive to changes in the auction format and adjust their bidding strategy accordingly (Roth & Ockenfels, 2002).

A first question in the current research is whether the bidding that we observed was rational. Rational choice suggests that bidders will stop bidding when they hit their limit (i.e., the price at which they value the item). The form that this rational stopping rule takes, however, will depend on whether the item is a common value or a private value item. Common value implies a consensus on the actual value of the item (i.e., there is a "true" value independent of who owns the item), although this value may not be known until after the auction ends. Examples of common value auctions include the sale of oil drilling rights or other items that are likely to be resold and for which there is a market. In such auctions, bidders can use the information contained in others' bids to help them estimate the true value of the items. In private value auctions, each individual's valuation of the item is independent of and unaffected by others' values. Because the idiosyncratic value of such items outweighs their resale value (if any), any information that might be gleaned from others' bids should not affect the bidding.

It is not immediately obvious whether the auctions that we studied were common or private value. Thus, we consider both possibilities. In general, private value auctions provide no rational reason for bidders to exceed their limits. In contrast, when bidding is public and sequential, common value auctions can lead bidders to rationally exceed their limits because others' bids can signal that the item has greater value than originally anticipated. Thus, if no one drops out early in a common value auction, bidders learn that the item's true value has probably not been reached. If many bidders drop out, the remaining bidders have reason to be cautious. This suggests that, if the auctions we followed were common value (a more conservative assumption since overbidding is always irrational in private value auctions), bidders could rationally exceed their limits as more people continued bidding.

This rational prediction is consistent with the concept of social proof, which suggests that people use others' behaviors to determine whether their own behavior is correct (Cialdini, 1993). In particular, when uncertainty is high and appropriate behavior is not obvious, people look to others as guides (Tesser, Campbell, & Meckler, 1983). Thus, in common value auctions, people may rationally bid past their limits because they are using personal *and* social information to evaluate an item's value.

Escalation of commitment and competitive arousal

In contrast to rational choice, auction fever implies irrational, emotionally charged overbidding. Thus, a descriptive rather than a prescriptive approach to auction fever may require models like escalation of commitment and/or competitive arousal. Escalation and competitive arousal models are not mutually exclusive. Instead, both processes can impact bidding behavior.

Escalation of commitment

Models of individuals' escalating their commitment to failing courses of action have a long history in the management and psychological literatures on decision-making (e.g., Staw, 1976). Escalation of commitment stems from the psychological inability to ignore sunk (irrecoverable) costs; it suggests that initial investment followed by negative feedback pushes individuals to justify their previous decisions, leading them to invest more rather than to rationally withdraw (Rubin & Brockner, 1975; Staw & Ross, 1987; Teger, 1980). Thus, student–investors who were responsible for making initial investments were more likely to continue investing in failing projects than were those who had not made the initial investment decisions (Staw, 1976; Staw & Ross, 1978). Similarly, managers who made hiring decisions subsequently evaluated the employees more favorably than did managers who were not involved in the hiring (Bazerman, Beekun, & Schoorman, 1982; Schoorman, 1988). People who have freely chosen a course of action also tend to narrow their attention and focus on information that helps them justify further commitment (Caldwell & O'Reilly, 1982). In essence, investments beget more investments, even when continuing is unwise. Since people are motivated to view themselves positively (e.g., Sedikides, 1993; Taylor & Brown, 1988), they try to avoid quitting, giving up, or admitting a mistake: investing more justifies their previous investments and provides hope of turning the tide.

In the auctions studied here, previous bids and/or time invested in the auction represent sunk costs. Individuals who are outbid by others may feel the need to justify their previous bids and their time investments, leading them to continue bidding even when they have reached their limits. Since self-justification helps preserve a positive self-image, auction winners should feel that they have done well, even if they bid past their initial reservation prices.

Competitive arousal

Although auctions and other instances of potential escalation often entail heightened arousal, escalation models do not explicitly include them as causal forces or outcomes. However, emotions and arousal are likely to be central elements in auction fever. For instance, Murnighan (2002) describes a classroom exercise in which an executive bid $2000 in a $20 auction (cf. Shubik, 1971). This auction has some unusual rules: high bidders win $20 and pay the amount that they bid, but second-highest bidders also pay what they bid but win nothing. This creates the potential for escalation since second-highest bidders have an incentive to continue bidding to avoid a certain loss (Shubik, 1971). The winner of this particular auction explained, "I found myself in a bidding war that seemed to have no end. As the dollars ran up and up, my internal stress level had reached a point where I was not thinking clearly about the ramifications about my decision" (Murnighan, 2002, p. 63). Clearly, arousal played a role in this executive's escalation.

To explicitly incorporate arousal into competitive decisions, we propose a new, competitive arousal model. Although both escalation and competitive arousal suggest that auction overbidding may not be rational, they do so for different reasons. Whereas escalation focuses on self-justification, competitive arousal focuses on heightened arousal. Anyone who has participated in public auctions knows that their harried pace can leave little time for careful decision-making. Bidding in auctions also generates an adrenalin rush that accompanies individuals' desires to win. These competitive feelings increase as auctions draw to a close, when few bidders remain and people may feel that they are in the spotlight (e.g., Gilovich, Medvec, & Savitsky, 2000). Climactic finales may reduce the social facilitation effects of coactors (cf. Zajonc, 1965) because fewer bidders remain, but they also heighten feelings of rivalry by making the competition more salient and increasing bidders' perceptions that they are close to winning.

The competitive arousal model posits that numerous factors can increase arousal and that arousal can impair calm, careful decision-making. Indeed, research on the effects of arousal shows that increased arousal can restrict attentional capacity (Mano, 1992), lead to less deliberation and less information processing (Lewinsohn & Mano, 1993), and increase risk taking (Mano, 1994). In the current auctions, numerous factors—rivalry, social facilitation, time pressure, and the uniqueness of being first—might increase arousal and lead individuals to bid past their limits. By examining how each of these factors stimulates arousal, the competitive arousal model provides a parsimonious means for understanding the influences of a variety of factors, suggesting that their effects on decision-making processes and outcomes are mediated by the arousal that they induce.

Allport (1924) noted that rivalry is experienced as an emotional state in which there is "consciousness of a desire to win" (p. 282). Empirical research has shown that arousal and anxiety tend to increase steadily before performance time (Gill, 1980). Mid-game rivalry also increases several measures of arousal, including heart rates and subjective ratings of anxiety (Bäckman & Molander, 1986a, 1986b), and can negatively impact performance (Jones, 1995). When the task is an auction, then, rivalry may be fiercest when only a few other individuals are vying for the coveted prize, causing bidders to bid past their pre-set limits when few rather than many others are present.

Social facilitation can also fuel overbidding. In his classic analyzes, Zajonc (1965; Zajonc and Sales, 1966) noted that the presence of an audience or coactors can increase arousal or "drive" and result in increased reliance on dominant responses (Markus, 1978; Zajonc, 1965; Zajonc & Sales, 1966). This enhances performance on well-learned tasks and reduces performance on complex or new tasks. For instance, the presence of an interested audience (Cottrell, Wack, Sekerak, & Rittle, 1968) or one that is perceived to be expert (Henchy & Glass, 1968) leads to the use of more well-learned and fewer novel responses. Guerin's (1986) review confirmed that both the mere presence of an audience and the presence of an evaluative audience could lead to social facilitation. Thus, bidders may be more likely to exceed their limits in live rather than in Internet auctions.

Time pressure is another element that is typical in auctions. Bidders at live auctions need to make quick decisions to bid and counter-bid; not doing so risks losing the item to a rival bidder. In Internet auctions, the pressure to make quick decisions also increases as the endpoint approaches. Research has shown that time pressure increases arousal (e.g., Cates et al., 1996; Maule, Hockey, & Bdzola, 2000) and leads people to rely more heavily on heuristics and to fall prey to their associated cognitive biases (Hogarth, 1980). For instance, Kruglanski and Freund (1983) showed that primacy effects, ethnic stereotyping, and anchoring increased with time pressure. Time pressure has also led people to re-use previous strategies and engage in fewer cognitive deliberations when they evaluated risky gambles (Ordóñez & Benson, 1997). Thus, bidders should be more likely to

bid past their limits towards the end of the auction, when there is little time left.

Finally, because the cities that we followed held their auctions over an extended period of time, the hype, national and local press coverage, and general public interest surrounding early auctions might have also increased arousal and facilitated higher bidding. As such, earlier cities may have benefited from a first-mover advantage, reaping the financial rewards of arousal from being novel and unique.

In sum, competitive arousal suggests that rivalry, social facilitation, and time pressure—elements inherent in auctions—as well as the uniqueness of being first, can fuel bidders' arousal, impair their decision-making, and push them to bid past their limits. More specifically, the competitive arousal model is unique in predicting that bidders will be more likely to exceed their reservation prices, and by greater amounts, when few rather than many other bidders remain (rivalry), particularly at the end of an auction (time pressure). The rivalry prediction contrasts with the rational choice notion for common value auctions, which suggests that bidders will be more likely to bid past their reservation prices when *more* bidders remain. Competitive arousal also suggests that audiences and co-actors will augment arousal, fueling greater overbidding in live rather than Internet auctions. Finally, competitive arousal predicts that, compared with later cities, bidders in early auctions like the Chicago cows should have experienced increased arousal stemming from the media hype and press coverage, also leading to more overbidding (and a first-mover advantage for Chicago).

Clearly then, several models (rational choice, escalation of commitment, and competitive arousal) may be relevant to the study of auction behavior. Thus, we present two studies to address their various predictions. Study 1 focused on the dynamics of auction fever, contrasting competitive arousal and escalation of commitment with rational decision-making processes. Study 2 is a more controlled laboratory experiment that further explores the mechanisms underlying escalation and competitive arousal.

Study 1

Study 1 includes archival and survey data from a large field study of live and Internet auctions. These auctions were particularly appropriate for an investigation of auction fever. First, they involved commodities with poorly understood values, which could boost variation in valuations, bids, arousal, and final prices. Second, data from different cities on comparable commodities allowed us to examine both within- and between-city differences, mitigating the possibility that the results were city-specific. Third, some of the Internet auctions provided extensive data, i.e., complete histories of who bid, how much they bid, and at what time, making thorough analysis possible. We were also able to collect survey data from many of the bidders. Fourth, some of these items sold for thousands of dollars, alleviating any concerns that the bidding was frivolous. And finally, the presence of both live and Internet auctions for the same basic commodities allowed for comparisons of these two formats.

Table 1 presents the three theoretical models, their different predictions, and the analyzes and data used to test the predictions. The competitive arousal model

Table 1
Predictions from rational choice, escalation, and competitive arousal models

	H1a	H2	H3	H4	H5	H6
	More overbidding when few, not many bidders	More overbidding late, not early in auction	More overbidding for live than Internet auctions	More overbidding for early, not late cities	More overbidding when bidding longer	Winners happy even if surpassing their limit
Data/test	Bid histories: partial correlation of number of limits exceeded with number of bidders	Bid histories: *t* test and partial correlation of number of limits exceeded with days	Surveys: χ^2 and ANCOVA of percentage of exceeders and amount exceeded respectively in live vs. Internet	Surveys: OLS regressions with time since first auctions on percentage of exceeders and amount exceeded	Bid histories: ANCOVA of time in auction for last day exceeders and non-exceeders	Surveys: ANCOVA of happiness and regret for buyers and non-buyers; χ^2 for limit exceeders and buyers
Rational choice	H1b—predicts the opposite if common value	—	—	—	—	—
Escalation	—	—	Yes[a]	—	Yes	Yes
Competitive arousal	Yes	Yes	Yes	Yes	—	Yes[b]

Note: Predictions that are underlined are those that are central for that model.

[a] This is a mild prediction, due to the possibility that justification needs are stronger in public rather than private contexts.

[b] Both competitive arousal and escalation models predict that winners will be happier even if they bid past their limits, but they do so for different reasons, as described in the text.

predicts that bidders will be more likely to overbid (i.e., exceed their limits) when few other bidders are active (Hypothesis 1a), as auctions come to an end (Hypothesis 2), in live rather than Internet auctions (Hypothesis 3), and in earlier rather than later auctions (Hypothesis 4). Escalation models also predict greater overbidding in live auctions because of the potentially greater need to justify public rather than private decisions. Rational choice predicts that bidders will exceed their limits when more active bidders remain, but only if we assume that the auctions are common value (Hypothesis 1b).

Escalation of commitment predicts that bidders will justify their initial decisions; thus, they will be more likely to exceed their limits the longer that they have been bidding[1] (Hypothesis 5). They should also be happier and have fewer regrets than non-buyers, even if they have exceeded their limits (Hypothesis 6). The competitive arousal model also predicts happy winners, even when they have exceeded their limits, but because they have fulfilled their desire to win rather than because of self-justification.

Both competitive arousal and escalation of commitment predict irrational overbidding, and both make similar predictions about live vs. Internet bidding and post-auction reactions (Hypotheses 3 and 6). Although these two models do not contradict each other, each also makes a set of unique predictions. Thus, Study 1 contrasts both models against rational choice and tests their implications. Study 2 further investigates the two models' differences.

Method

Table 2 provides background information on the 21 auctions that we investigated. These auctions varied in many ways. The live auctions were all English auctions: bids increased until one winner remained. Some cities provided bidders with estimates of each item's value; others did not. Some live auctions preceded the Internet auctions; others followed them. For some cities, part or all of the auctions started on the Internet and transitioned to the live auction with starting prices in the live auction being determined by the final Internet bid. Some cities put their items in lots with different end times. Internet auction lengths varied, with some having an exact end and others flexible endings. Bidders in all of the Internet auctions could bid by proxy, submitting a maximum bid and allowing the system to automatically increase their bid (as needed) up to their stated limit. Internet bidders had access to information on the current bid, the opening bid, the time remaining, the minimum increment necessary to beat the current bid, and (except for Boston) a chronological list of all of the previous bids, bidders' IDs (except for a small number of Cincinnati auctions), and the amount and time of each bid. Some cities restricted this information to recent bids or to the current bid.

Our primary dependent measures were when and by how much individuals bid past their limits. We operationally defined bidders' limits (i.e., their reservation prices) as their proxy bids, that is, the maximum bids they set with the proxy bid system, which we derived from the Internet bid histories. For instance, on eBay, when the time stamp on a larger bid by Person A was earlier than a smaller bid by Person B, this was evidence that Person A had placed a proxy bid (at the earlier time). If and when the proxy bid was surpassed, that is, if Person A re-entered the bidding and placed a bid that was higher than the earlier proxy bid, this was considered an instance of bidding past one's limit, i.e., overbidding. Bidders who set limits and later exceeded them without using the proxy bidding system could not be tracked, making this a conservative measure.

As is often the case, our operational definition of bidders' limits may not perfectly represent some bidders' maxima. For instance, some bidders could have used the proxy bid system to test different bids or to try out the proxy bid system. Most of our survey respondents, however, indicated that their proxies were their maxima (e.g., "max personal limit", "what we were willing to spend," "the most I was willing to bid," "by how I valued it"). Also, our hypotheses predict specific *patterns* of overbidding rather than the mere occurrence of overbidding. At the extreme, if proxies never represented bidders' true limits (i.e., they were arbitrary), then choices to exceed proxy bids would be unsystematic and none of the hypotheses would be supported. In contrast, if overbidding is influenced by the presence of other bidders, the amount of time left in the auction, or the time that a person has spent in the auction, we gain confidence in the measure's validity.

Our surveys targeted as many bidders and auction attendees as organizers allowed. For the Chicago cows, we could only contact winners and the last two bidders to drop out in the Internet auctions; in Arlington Heights, IL, post-auction surveys were only sent to pony winners. Other cities, however, gave us more complete access, ranging from providing complete mailing lists to having volunteers distribute pre-auction surveys. Pre- and post-auction surveys asked people how many items they hoped to purchase, whether they set limits for themselves, and what these limits were. Post-auction respondents were also asked about their highest bids, whether they won an auction, how happy they were, how much regret they felt after the auction, their auction expertise,

[1] One obvious measure of investment in an auction is the number of bids a person has made. In the Internet auctions, however, this may not reflect a bidder's actual investments because bidders could make a single proxy bid and let the computer automatically place subsequent bids. Someone choosing this option might appear to have made many bids even though they only made one maximum bid. Thus, we use time in the auction as our measure of investment.

Table 2
Average and final prices for 21 live and Internet auctions

	Live auctions			Internet auctions				
	Date	*n*	Average final prices	Starting date	Duration (days)	*n*	Average final prices	Ending
Live only								
Arlington heights ponies	8/18/00	35	$1956					
Whitefish moose	9/14/00	15	$10,033					
Belfast bears	10/20/00	35	$1266					
Des Moines pigs	10/20/00	36	$1431					
New Orleans fish	11/9/00	103	$5267					
Lexington horses	12/2/00	79	$9,590					
Internet before Live								
Chicago cows	11/9/99	65	$32,146	11/1/99	8	75	$18,503	Flexible
Cincinnati pigs	11/13/00	65	$6,177	11/1/00	7	167	$2,722	Fixed
Chicago chairs	10/20/01	62	$724	10/12//01	7	99	$456	Flexible
Live before Internet								
New York cows	9/28/00	74	$18,257	9/28/00	7–11	150	$10,617	Flexible
St. Paul Snoopies	10/1/00	40	$20,575	11/24//00	14	21	$10,405	Flexible
Other								
Buffalo buffalo[a]	10/24/00	55	$5,723	10/14/00	7–8	79	$4475	Fixed
Boston cod[a]	12/8/00	67	$3,290					
Toronto moose[b]	1/29/01	31	$3,559	1/15/01	6–29	137	$3,034	Flexible

[a] Auctions transitioned from Internet to Live.
[b] In US dollars, converted at 1 USD = 1.5 CAD (approximate exchange rate for January 2001).

and demographic questions. The post-auction surveys provided a second, self-report measure of whether and by how much individuals bid past their limits.

Although data availability varied across cities, our analyzes included as much data as possible. This meant that some cities' data were included in some analyzes but not others.[2] In particular, analyzes based on Internet bid histories were limited to the Chicago cows, Cincinnati pigs, and St. Paul Snoopy auctions.

Results

Overview of the data[3]

The average final prices varied widely (see Table 2), with the high and the low averages both resulting in Chicago: the Chicago cows averaged $32,146 in the live and $18,503 in the Internet auctions; the Chicago furniture averaged $724 and $456, respectively. The average final price across all auctions was $9147 for live ($n = 762$) and $6137 for Internet auctions ($n = 728$). Most Internet bidders bid on the first (17%) or the last day of the auctions (35%).

The Internet bid histories indicate that the most overbidding (i.e., bidding past proxy limits) took place in the Chicago cow auctions, with 466 people (72%) exceeding their pre-set limits a total of 995 times. On average, 13.2 limits were exceeded for each item in the auction. In Cincinnati, 147 people (40%) overbid 179 times, an average of 1.5 times for each item. In St. Paul, only 10 people (13%) overbid 11 times, revealing considerable differences in the frequency of overbidding across cities.

Response rates for the post-auction surveys ranged from 20 to 48% for the live and 15–27% for the Internet auctions; 57% ($n = 101$) of the live and 37% ($n = 92$) of the Internet respondents bought (won) items. On average, the highest bids of survey respondents who bought items in the live auctions averaged $10,465 ($SD = $17,887), no different from the average final price of live items ($t(97) = .73$, $p = .47$). Similarly, the average of the highest bids of Internet respondents who bought items was $6832 ($SD = $8043), no different from the average Internet final price ($t(83) = .79$, $p = .43$). These data suggest that the survey respondents were representative of bidders, buyers, and non-buyers.

Respondents' ages did not vary significantly across cities ($F < 1$) or between buyers and non-buyers ($F < 1$), but

[2] Rather than describe the domain of each of the analyzes, interested readers can request a breakdown of the data that are included in each of the analyzes from the authors.

[3] Although not the central focus of our analyses, we also collected data on the attractiveness of the items using a random sample of items from each of the cities except Whitefish (no pictures were available) and the Chicago furniture suites (which were displayed after we obtained these ratings). Using a single 7-point scale, 40 executive MBA students volunteered and rated the attractiveness of 336 items (26% of the items auctioned). Although a regression analysis controlling for cities revealed that attractiveness predicted final prices over the entire sample of 336 items ($\beta = .21$, $p < .05$), aggregating the data so that each city had a single, average score led to no effect of attractiveness on average final prices ($\beta = -.33$, $p = .24$). In other words, average attractiveness could not predict between-city differences in final price.

live respondents ($M = 49.9$, $SD = 11.2$) were older than Internet respondents ($M = 44.1$, $SD = 10.2$; $F(1,391) = 7.49$, $p = .006$). Almost half of the respondents ($n = 186$; 45%) were women. Responses to questions about annual income varied: although some respondents did not provide numerical amounts (e.g., "high," "enough," and "upper 1%"), the numerical responses that were reported resulted in an average family income of $232,495 ($SD = $422,358) and yielded no significant differences between live and Internet respondents ($F < 1$), across cities ($F < 1$), or between buyers and non-buyers ($F < 1$).

Most survey respondents (82%) reported setting limits for themselves prior to bidding. Although there were no differences in frequencies for reported limit setting in pre- (74%) and post-auction surveys (80%; $\chi^2(1,185) = .98$, $p = .32$), the amounts of reported limits were significantly greater in post- than in pre-auction surveys ($M = $3511, $SD = $2415 and $M = $2330, $SD = $2152, respectively; $F(1,125) = 8.78$, $p = .004$, controlling for city differences with dummy variables). This suggests that people reinterpreted their limits after the auction, possibly to justify overbidding. Excluding an outlier[4] from the Chicago cow Internet auctions and controlling for city differences with dummy variables, the average limit (from post-auction surveys) for the live auctions ($M = $5974, $SD = $7953) was significantly higher than the average limit for the Internet auctions ($M = $3393, $SD = $3711; $F(1,345) = 26.27$, $p < .001$).

Across cities, live respondents reported having more auction expertise than Internet respondents ($M = 4.5$, $SD = 1.9$ vs. $M = 3.6$, $SD = 1.9$ on a 7-point Likert scale; $F(1,382) = 5.36$, $p = .02$), as did men compared to women ($M = 4.4$, $SD = 1.9$ vs. $M = 3.6$, $SD = 2.0$; $F(1, 382) = 12.58$, $p < .001$). It is notable that, controlling for auction format and city with dummy variables, buyers reported less expertise than non-buyers ($M = 3.9$, $SD = 2.0$ vs. $M = 4.2$, $SD = 1.9$; $F(1,405) = 5.12$, $p = .024$), but expertise did not differ between those who reported exceeding their limits and those who reported not exceeding their limits (Ms = 4.0 and 4.1).

Hypothesis testing: rational choice and competitive arousal model

The data show that, as predicted by competitive arousal, people exceeded their limits more when few rather than many other bidders remained in the auction (Hypothesis 1a): after standardizing bid data within each city and controlling for the day of the auction and the number of bids per day, the number of active bidders was negatively correlated with the number of times they surpassed their limits ($r = -.79$, $p < .001$). Thus, bidders exceeded their limits more when fewer rather than more bidders remained. This supports the competitive arousal model, which predicts that a heightened sense of rivalry will lead to greater overbidding. The rational choice model (Hypothesis 1b) predicted the opposite for common value auctions and was not supported.

Analyzes of bid histories also supported competitive arousal's prediction that bidders exceeded their limits more at the end rather than at the start of the auctions (Hypothesis 2): an average of 2.9 limits were exceeded on the last day versus 6 on the first, paired-sample $t(218) = 8.40$, $p < .001$. After standardizing data within each city and controlling for the number of bids per day, instances of limits being exceeded were negatively correlated with the number of days left in the auction, $r = -.51$, $p = .003$. This effect was primarily due to the Chicago cows ($r = -.73$, $p = .04$); the Cincinnati and St. Paul data were negatively correlated but not significant ($r = -.04$ and $r = -.40$). Before taking these data as evidence for competitive arousal's time pressure prediction, it is important to determine if most bidders only reached their limits later in the auctions. Bid data on dropping out of the auction permanently (a sure sign that limits were reached) makes this explanation unlikely: overall, 3.3 bidders did not win an item and dropped out on the first day compared to 3.6 bidders on the last day (paired-sample $t(217) = 1.12$, $p = .26$). Similarly, when we consider the number of bidders active on each day, 73% of first-day bidders and 77% of last-day bidders dropped out (paired-sample $t(98) = 1.32$, $p = .19$).

The tests of Hypotheses 1a, 1b, and 2, however, may be confounded in Chicago because, although more limits were exceeded on the last day than on the first, there were also fewer bidders on the last day. A random-effects, generalized least squares regression for the Chicago bid history data, using item-per-day as the unit of analysis, tested the impact of time remaining and number of other bidders (the two components of competitive arousal: time pressure and rivalry) on bidding behavior. The dependent variable was the ratio of limits exceeded to the number of bidders on that day for each cow. We used Day (1–9), Activity (number of bidders that day; cases where 0 or 1 bidders were active were dropped from the analysis), and Price (the price of the item when the day began) as predictors. Price was a control variable because bidders might exceed their limits more when the price was relatively high (or low) compared to the price of other items. Random-effects generalized least squares regression was appropriate because the same item received bids on multiple days, making bids across days for the same item not strictly independent. Deviation scores were used for the predictor variables to address multicollinearity problems (Cronbach, 1987). (A fixed-effects GLS regression and an OLS regression with robust standard errors yielded the same results.) The analysis yielded significant effects for Day ($z(401) = 9.97$,

[4] This respondent indicated that his limit was $150,000. Including this individual increases the Internet average from $3393 ($SD = $3711) to $4075 ($SD = $10,662).

$p < .001$) and Activity ($z(401) = -3.19$, $p < .001$) and a significant Day × Activity interaction ($z(401) = -2.90$, $p < .01$), with no effect for Price. Thus, the likelihood that bidders exceeded their limits on a particular day was negatively related to the time remaining in the auction (supporting Hypothesis 2). Controlling for time left in the auction, bidders were more likely to exceed their limits when few other bidders remained (supporting Hypothesis 1a). Finally, the interaction indicates that few bidders plus little time remaining had a particularly potent effect on limits being exceeded. Thus, the potential confound does not appear to be a problem. Instead, the data provide strong support for competitive arousal. Specifically, both rivalry and time pressure (separately and together) led bidders to bid past their limits.

Competitive arousal's social facilitation prediction suggested that more limits would be exceeded, by greater amounts, in live rather than in Internet auctions (Hypothesis 3). The survey data provided no support for the percentage of exceeders (35% in live and 38% Internet auctions; $\chi^2(1,357) = .23$, $p = .63$) but provided strong support for the amounts by which limits were exceeded: live auction bidders exceeded their limits by more than Internet bidders ($M = \$5609$, $SD = \$15{,}267$; $M = \$1134$, $SD = \$1584$, respectively; $F(1,122) = 15.74$, $p < .001$, controlling for city differences with dummy variables). These differences remained significant when the Chicago cow data (with live vs. Internet amounts-exceeded of $28,825 vs. $3107) were excluded. Not surprisingly, then, final prices were also higher for live auctions. In every city, the average final price in the live auctions was higher than the average final price in the associated Internet auctions (see Table 2).

The competitive arousal model also predicted that, because of heightened arousal from increased press coverage and novelty surrounding earlier auctions, earlier auctions would lead to more limit exceeding, and by greater amounts (Hypothesis 4). The survey data supported this prediction for the percentage of respondents exceeding their limits but not for the amounts exceeded. Stepwise OLS regressions, controlling for auction format, indicated that the number of days since the first Chicago auctions (our dependent variable) predicted the percentage of respondents exceeding their limits ($\beta = -.69$, $p = .02$): the later the auction, the lower the percentage of limit exceeders (see Figs. 1 and 2). The R^2 increase of .48 was significant ($F(1,8) = 8.13$, $p = .02$). The results are in the same direction but are not significant ($\beta = -.41$; $\Delta R^2 = .14$; $F(1,6) = 1.15$, $p = .33$) when the Chicago cow data are excluded. Including controls for macro-economic changes that may have occurred over the time span covering these auctions such as stock market performance, retail sales, consumer confidence index, and consumer expectation index did not change these results.

Hypothesis testing: Escalation of commitment

Escalation of commitment's prediction that bidders would exceed their limits more when they had invested more rather than less time in an auction (Hypothesis 5) was also supported. For each bidder who was active on the last day of the auction, had placed a proxy bid, and had reached their proxy limit, we calculated the number of days since they had submitted their first bid from the bid histories. Controlling for city differences with

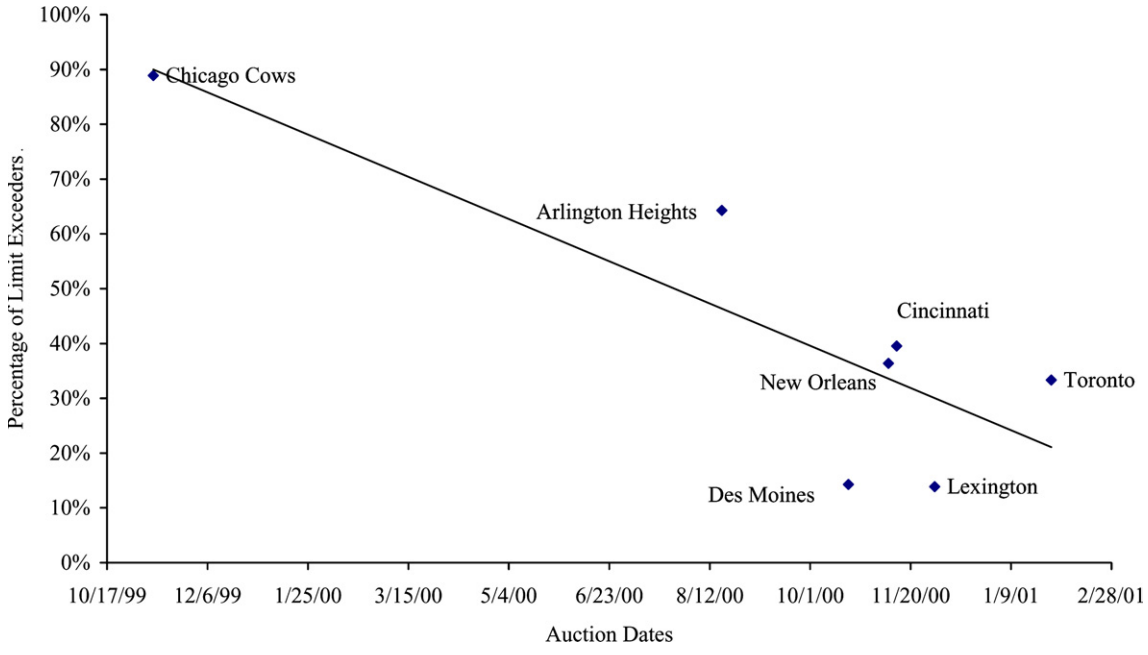

Fig. 1. Average percentage of limit exceeders for live auctions in chronological order.

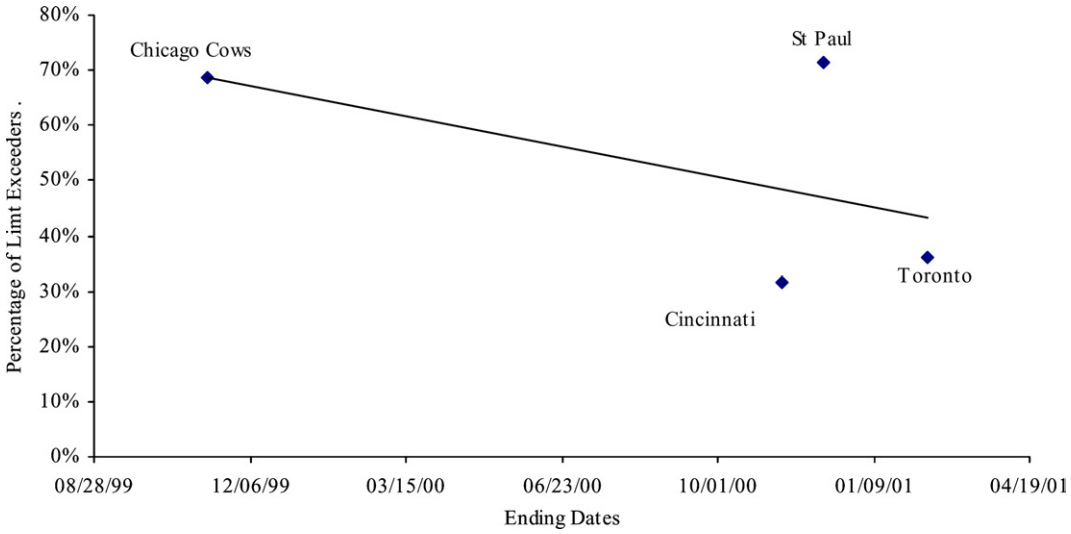

Fig. 2. Average percentage of limit exceeders for Internet auctions in chronological order.

dummy variables, bidders who exceeded their limits on the last day had invested more time in the auction ($M = 1.8$ days, $SD = 2.8$ days) than bidders who reached their limit but did not exceed it ($M = .7$ days, $SD = 1.8$; $F(1,416) = 9.89$, $p < .005$). This finding held directionally for the Chicago cow and Cincinnati data, but not for the St. Paul data. Importantly, because the analysis focuses only on those who set and reached their proxy bid limit on the last day of the auction, the results are not driven by individuals who did not set a limit or who had placed (extremely high) limits late in the auction, which were then never reached.

The survey data also supported the escalation prediction that buyers would be happier and have fewer regrets than non-buyers (Hypothesis 6). Controlling for auction format and for city with dummy variables, buyers were happier ($M = 5.9$, $SD = 1.0$ vs. $M = 3.4$, $SD = 1.6$; $F(1,406) = 257.84$, $p < .001$) and had fewer regrets ($M = 6.0$, $SD = 1.2$ vs. $M = 5.1$, $SD = 1.8$; $F(1,408) = 20.93$, $p < .001$) than non-buyers. Also, buyers and non-buyers were just as likely to exceed their set limits (32 and 31%; $\chi^2(1,418) = .08$, $p = .77$), suggesting that the buyers' greater happiness was not simply a function of getting a good deal.[5]

[5] A clear prediction of the rational choice perspective is that it is better not to buy an item if you will have to pay more than the item is worth to you. The escalation of commitment perspective accommodates the opposite prediction. Thus, a more pointed test of Hypothesis 6 (controlling for auction format and for city using dummy variables) showed that buyers who exceeded their limits were significantly happier ($M = 5.9$, $SD = 1.1$ vs. $M = 3.4$, $SD = 1.6$; $F(1,273) = 87.56$, $p < .001$) and had directionally fewer regrets ($M = 5.7$, $SD = 1.5$ vs. $M = 5.1$, $SD = 1.8$; $F(1,276) = 1.79$, $p = .18$) than non-buyers. Hence, the broader findings that support escalation of commitment are not driven by the 68% of buyers who did not exceed their limits and who may have obtained a good deal on their purchase.

Discussion

These data tested the predictions of competitive arousal, escalation of commitment, and rational choice. They also provide the groundwork for greater understanding of auctions in situ and, potentially, of high stakes, high arousal decision-making. The competitive arousal model received considerable support: bidders exceeded their limits more in the later stages of auctions and more often when few other bidders remained. Although the percentages of live and Internet survey respondents who reported exceeding their limits were similar, live auction bidders reported exceeding their limits by greater amounts than did Internet bidders. In addition, because of the novelty and hype surrounding earlier auctions, these auctions benefited from a first-mover advantage, with more bidders exceeding their limits in earlier auctions, a finding that could not be explained by changes in the economy.

Escalation of commitment was also supported: Internet limit exceeders had invested more time in auctions than had non-limit-exceeders and, as reflected by their reported happiness and regret at the end of the auctions, buyers tended to be quite content with their purchases despite exceeding their limits as often as non-buyers. Thus, both escalation and competitive arousal models provided considerable insight into the phenomenon of auction fever. Rational choice received no support.

A lingering concern may be whether these were typical auctions. If they are completely unique, they say less about the dynamics of auctions and individual decision-making generally. There are some indications, however, that these auctions are not unusual. First, the items in these auctions were unique (they were similar to each other but were not generally available items) and had values that were difficult to determine, precisely the

conditions under which sellers tend to prefer auctions to other selling mechanisms (McAfee & McMillan, 1987). Second, the surveys suggested that Internet bidders had less auction experience than live bidders, which is consistent with previous findings (Lucking-Reiley, 2000).

Finally, bidders might have exceeded their limits because they could subsequently donate less to other charities, making their auction bids essentially costless. However, most of our survey respondents (94% of the limit exceeders) indicated that their bids would not affect their future donations. In addition, this explanation cannot explain why bidders exceeded their limits more in live than in Internet auctions, when fewer others remained, or when the auctions approached their endpoints. However, to ensure that these findings are not unique to this study, and to further explore the mechanisms underlying escalation of commitment and competitive arousal, we conducted a second study.

Study 2

Study 2 investigated the reliability of Study 1's findings and the similarities and differences between escalation of commitment and competitive arousal. Although we believe that both escalation and competitive arousal can result in overbidding, we also believe that different mechanisms are involved—whereas justifying prior sunk costs is key in escalation, increased arousal is fundamental to competitive arousal. Thus, Study 2 experimentally manipulated sunk costs and rivalry in an auction scenario study. We manipulated sunk costs by changing the amount of time and energy individuals had invested in researching the auction item and attending the auction, predicting that high sunk costs would result in more overbidding than low sunk costs. We manipulated rivalry by changing the number of other bidders, predicting that fewer bidders would result in stronger feelings of rivalry and more overbidding. We also investigated the underlying mechanisms for overbidding by assessing the effects of increased arousal and the desire to self-justify.

Method

Participants

Participants were 52 undergraduate students (26 males and 26 females) who received $10 for their participation. One participant was eliminated from the analyzes because she misunderstood the instructions.

Design and procedure

The experiment was a 2 (rivalry: low vs. high) × 2 (sunk costs: low vs. high) between-participants design. Upon arrival, participants were told that we were interested in studying auction decisions. They read a scenario that asked them to imagine that they were attending an auction for an item that they "really, really wanted." The item was described as the only one of its kind at this auction and participants were asked to imagine that they did not think that they would find the item anywhere else. Participants then learned that they had checked out the item briefly on the Internet and had driven 5 min to get to the auction or that they had spent a lot of time doing on-line and library research and that they had driven three hours to get to the auction. (This was the sunk costs manipulation.) The scenario then asked them to imagine that, although they would like to pay as little as possible, they had decided before the bidding began that that they would pay as much as $150 for this item.

The scenario indicated that, when the bidding began, many bidders seemed interested, and the price went up quickly. Eventually, either one or eight bidders remained in the auction. (This was the rivalry manipulation.) Participants were then informed that their last bid was $145, that another person had bid $150, and that the next bid would be $155. They were all led to believe that speed was critical and that they needed to make their decision to bid or not bid in 3 s.

Independent variables. Half of the participants were randomly assigned to the low (eight other bidders) and to the high (one other bidder) rivalry conditions. Half were also randomly assigned to the low (brief Internet research and five minutes of driving) and to the high (a lot of on-line and library research and three hours of driving) sunk costs conditions.

Dependent measures. To measure overbidding, we asked participants to report the likelihood (from 0 to 100%) that they would make the next bid of $155 (which would exceed their pre-set limit of $150). We also asked them to predict their chances of winning (from 0 to 100%). On 7-point scales, they indicated their level of expertise about the item, whether their decisions were influenced by the time they had invested in researching the item and driving to the auction, and whether they felt excited and anxious about the auction. Participants were then thoroughly debriefed, thanked, and paid.

Analyzes. The primary dependent variable was the likelihood (0–100%) of making the next bid, which was analyzed in a 2 (rivalry: low vs. high) × 2 (sunk costs: low vs. high) analysis of variance (ANOVA). Because participants' expectations of winning (which might be higher when few other bidders remained) or their presumed expertise (which might be higher when more time had been invested in research) might influence the findings, we used these two variables as covariates in an analysis of covariance. This analysis did not alter the findings. Thus, we only report the ANOVA.

Individuals' reported feelings of anxiety and excitement were significantly correlated ($r = .31$, $p < .03$) and

were combined to form an index of arousal. To test the effects of rivalry and sunk costs on arousal and self-justification, we analyzed these dependent variables in separate 2 (rivalry: low vs. high) × 2 (sunk costs: low vs. high) ANOVAs.

Results and discussion

Competitive arousal and escalation predicted that individuals would be more likely to overbid when faced with high rivalry and high sunk costs, respectively. Both predictions were supported (see Table 3 for means and standard deviations). A main effect for rivalry indicated that overbidding was more likely for high rather than low rivalry ($M = 87.9\%$, $SD = 13.3\%$ vs. $M = 74.8\%$, $SD = 29.7\%$; $F(1,47) = 5.38$, $p < .03$); a main effect for sunk costs indicated that overbidding was more likely for high rather than low sunk costs ($M = 92.5\%$, $SD = 7.4\%$ vs. $M = 69.5\%$, $SD = 29.2\%$); $F(1,47) = 16.47$, $p < .001$. There was also a marginally significant rivalry × sunk cost interaction ($F(1,47) = 3.36$, $p = .07$), with the least overbidding by individuals facing low rivalry and low sunk costs.

Competitive arousal predicted that the effects of rivalry would work through increased arousal. Although only marginally significant, the results were in the right direction: participants who faced one other bidder ($M = 6.3$, $SD = .6$) reported more arousal than those who faced eight other bidders ($M = 6.0$, $SD = .8$; $F(1,47) = 2.49$, $p = .12$). High sunk costs also led to marginally more arousal than did low sunk costs ($M = 6.3$, $SD = .6$ vs. $M = 6.0$, $SD = .8$; $F(1,47) = 3.54$, $p < .07$). The rivalry × sunk costs interaction was not significant ($F(1,47) = 1.37$, $p = .25$).

Escalation predicted that the effects of sunk costs would work through the justification of prior investments. This prediction was supported by a main effect for sunk costs: participants indicated that their decision had been influenced by the time invested more when their sunk costs were high compared to when they were low ($M = 6.4$, $SD = .8$ vs. $M = 4.4$, $SD = 1.7$; $F(1,147) = 28.90$, $p < .001$). Neither rivalry nor the interaction was significant (Fs < 1).

Finally, we conducted a mediation analysis to test whether arousal or justification were driving the effects of rivalry and sunk costs on overbidding (see Table 4). Consistent with Baron and Kenny (1986), we first found that sunk costs significantly predicted justification and rivalry marginally predicted arousal. Rivalry and sunk costs also predicted overbidding. When the two mediators—justification and arousal—were entered into the regression with rivalry and sunk costs, sunk costs still had significant effects but rivalry's effects were now only marginally significant. This indicates that justification needs did not mediate the effects of sunk costs on overbidding. Arousal, however, partially mediated the effects of rivalry on overbidding. Since the effects of rivalry on arousal were only marginally significant, however, we interpret this effect with caution.

Table 3
Means and standard deviations (in parentheses) for overbidding in Study 2

	Low rivalry	High rivalry	
Low sunk costs	58.5% (34.8%)	81.5% (15.4%)	69.5% (29.2%)
High sunk costs	91.2% (7.1%)	93.8% (7.7%)	92.2% (7.4%)
	74.8% (29.7%)	87.9% (13.3%)	

Table 4
Mediation analysis for effects of arousal and justification on overbidding

	Dependent variable		
	Justification	Arousal	Overbidding
Step 1			
Rivalry	−.04 (.37)	.21^{+} (.19)	.27* (5.68)
Sunk costs	.62*** (.37)	.26^{++} (.19)	.48*** (5.68)
Step 2			
Rivalry			.20^{++} (5.59)
Sunk costs			.43** (6.91)
Justification			−.05 (2.20)
Arousal			.32* (4.24)
Change in R^2			.09
F change			3.33*

Standardized coefficients with standard errors in parentheses.
* $p < .05$.
** $p < .01$.
*** $p < .001$.
$^{+}$ $p < .15$.
$^{++}$ $p < .10$.

Overall, these results support both competitive arousal and escalation, and they corroborate Study 1's findings. Rivalry and sunk costs increased the likelihood of overbidding, and the effects of rivalry were partially mediated by arousal. We do, however, interpret all findings with due caution given the relatively small sample size. Additionally, these effects are particularly notable because they appear in a scenario study, in which real feelings of arousal may be limited.

Finally, the surprising finding that high sunk costs led to increased reports of arousal suggests that the previously unconsidered effects of escalation of commitment on arousal (and vice versa) are worthy of future research. This is particularly true given this study's regression results: when arousal and justification were analyzed together as mediators, only arousal predicted overbidding.

General discussion

This paper investigated auction fever in an extensive field study and a laboratory experiment. We also presented a new model of decision-making, the competitive

arousal model, and tested its predictions in conjunction with those of rational choice and escalation of commitment. Study 1's large set of bidding and survey data supported the escalation and competitive arousal models, but did not support the implications of rational choice. The findings for escalation focused on the amount of time invested (sunk costs) and post-auction accounts of happiness and regret. The findings for competitive arousal focused on the number of other bidders (rivalry), time pressure, live vs. Internet auctions (social facilitation), and hype and arousal from being the first mover.

With a focus on sunk costs and rivalry, Study 2 provided additional support for the models, as both sunk costs and rivalry led to overbidding. Study 2 also suggested that arousal might result from both rivalry and from sunk costs. Overall, the data suggest that overbidding in auctions is driven by the heightened arousal resulting from rivalry, time pressure, social facilitation, and being first. It may also be driven by sunk costs.

Escalation of commitment and competitive arousal

The extensive literature on escalation of commitment (e.g., Staw, 1976; Staw & Ross, 1987, 1989) charts the inappropriate decisions of individuals who have made an initial decision, have received negative feedback, and must make another decision on the same issue. Even in short experiments, this sequential process represents a series of calm, collected decisions that take some time. Although escalation models do refer to fear as contributing to the escalation process, they do not typically include arousal as a central causal force.

In contrast, bidding in auctions usually requires a series of rapid decisions, often in quick succession. In addition, live auctions are social events, accompanied by cheering (or jeering) audiences and the sight of one's rivals, which encourages bidder competition. When auctioneers promote and publicize their events, this magnifies the potential for arousal. In other words, time pressure, rivalry, social facilitation, and hype can all combine to intensify arousal and contribute to impaired decision-making, i.e., overbidding. The competitive arousal model captures these processes by identifying arousal as a central, critical element.

The finding that sunk costs can be arousing is novel and theoretically intriguing. The original paper on escalation of commitment (Staw, 1976) treated it as a form of dissonance reduction, and dissonance has always been characterized as a type of generalized arousal that is motivating (Festinger, 1957; Zanna & Cooper, 1974). Thus, it should not be surprising that individuals faced with sunk costs experience arousal. Arousal that results from dissonance, however, seems qualitatively different from the more visceral excitement that auctions generate. Thus, although it might be tempting to posit a consolidation of escalation of commitment and the competitive arousal model, future research is necessary to understand the nature and the qualities of arousal that are generated by sunk costs, as opposed to the arousal that is prompted by auctions. At a minimum, however, the current research suggests that arousal may be an important element in escalation of commitment: sunk costs may not only prompt a need for self-justification, they may also increase arousal. Since arousal impairs careful decision-making, a vicious cycle may be spawned with sunk costs generating arousal, which then leads to more escalation and yet further arousal (see also Ku, 2004; Ku et al., 2004).

As we might have expected at the outset of this project, the data supported the predictions of both escalation and competitive arousal models. What is surprising is the fact that so little of the extensive literature on individual decision-making deals with the arousal that often accompanies high stakes decisions (Moore, 2000). Thus, the current findings provide the basis for exploring a broad model of decision-making that includes both cognitive and emotional/arousal components. Even though the emotional elements in such a model require considerable research, the competitive arousal model provides a succinct means of considering how seemingly disparate variables can contribute to increased arousal and result in choices that suffer from a lack of deliberation and care, including simple miscalculations and an accentuation of heuristics that increase cognitive biases. Thus, we suggest that competitive arousal may be generally applicable, as it can affect decision-making in many contexts. Space limits our ability to present many examples, but we present a few here, briefly.

Kaplan (1995a, 1995b) described the competition between Viacom and QVC over Paramount, pushing Paramount's price up and their own stock prices down. From late 1993 through early 1994, both companies alternated in increasing their bids until they were both bidding well above the market valuation for Paramount. In the end, Viacom won the battle, but they clearly paid too much (Hietala, Kaplan, & Robinson, 2003). Subramanian's (2001) account of NBC's purchase of the TV show "Frasier" is similar, highlighting the impact of both rivalry (NBC vs. CBS) and time pressure (negotiating as a deadline approaches). Similar factors are characteristic of a variety of organizational decisions, including firms bidding against each other for highly valued contracts, salespersons and partners competing against their co-workers for business or revenue, and headhunters competing in the labor market for management and technical talent.

All of these examples take the concept of auction fever far beyond auctions to other potentially fevered decision-making contexts in and between organizations that can easily result in miscalculation and unfortunate, if not financially disastrous, decisions. These examples

also support the idea that escalation phenomenon might also involve competitive arousal: it may not simply be self-justification that drives escalation to negative decisions, but emotional arousal as well. The bottom line is that either competitive arousal or escalation of commitment (or both) can afflict decision-makers and result in decisions that may be far more costly than overbidding in an auction.

Conclusions

The key elements of competitive arousal—rivalry, time pressure, social facilitation, and the first-mover advantage—may surface not only in auctions but also in many other decision-making contexts. This leads us to view competitive arousal as a general decision-making phenomenon, with considerable potential for broad applicability. The excited, frantic rush of urgency that accompanies the final moments of an auction may not be unlike the experience of other time-pressured, competitive decisions, in organizations and other contexts. Our hope is that competitive arousal will provide another step toward understanding the potentially serious and consequential influences of emotional factors in decision-making.

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